

EXHIBIT A



The art of medicine

The misuses of “biological sex”

Whether one is entering into military service, seeking identity documents, or participating in sports, the categorisation of bodies according to “sex” is central to the organisation of society. Who is categorised as a woman and who is categorised as a man may seem like simple questions, but making a determination of sex has long been understood as far from straightforward.

For a century, scientists studied an array of human characteristics that inform our ideas of what makes someone a woman or a man, seeking to pin down a single, definitive biological indicator of sex. Bodies troubled these schemes and socially untenable categorisations ensued. If gonads were understood as the essence of sex, women who were phenotypically female but who had testes were men. This seemed illogical, so scientists proposed yet other traits. Even as they debated which biological trait or combination of traits signalled its essence, scientists understood sex as biological and involving multiple, if contested, factors.

Contemporary scientific understanding of sex and its relation to gender was greatly influenced by the work of psychologist John Money, at Johns Hopkins University, USA, beginning in the 1950s. With colleagues, Money further complicated approaches to sex by identifying a range of biological and social factors. Chromosomes, gonads, hormones, and internal and external genital morphology were considered alongside social factors such as assigned sex and rearing, and gender role and sexual orientation. His ideas gained traction, and scientists and medical professionals came to accept sex as inherently knotty: that its “variables” are multiple, come in far more than two versions, and that no single biological factor is determinative.

Research since has expanded the range of variables that produce sex. As one example, the Y chromosome was once

said to trigger testes development in fetuses. Later research showed a gene called SRY, located on the Y chromosome, “pushed” primordial germ cells in the embryo to become testes. We now know there are active genes involved in both ovary and testis determination across the genome, and not restricted to the X and Y chromosomes. As biologist Anne Fausto-Sterling has observed, “[T]hose looking to biology for an easy-to-administer definition of sex and gender can derive little comfort from the most important of these [research] findings.”

If what we know of sex is its multiplicity, this introduces a conundrum: which factors to use in categorising and defining sex? Policy makers who formulate sex categorisations and definitions overwhelmingly rely on biological features to ground membership. Biological factors hold appeal and power since reference to “biology” and “science” lends any suggested trait or combination of traits the appearance of neutrality and thus objectivity. But biological definitions of sex are at odds with the understanding that sex involves multiple biological and social factors. They are also at odds with social scientific work that complicates the idea that sex is biological whereas gender is cultural; sex, as much as gender, is culturally contingent and produced. As J R Latham notes, “sex” is not a static, discrete, or even strictly biological characteristic that exists prior to the relations and practices that produce it. Historian of science Sarah Richardson, for example, has shown how scientists “sexed” the X and Y chromosomes by glossing over inconsistencies and ambiguities between the two in their research to elevate findings that align with gendered ideas about biological sex differences.

Decisions about which traits or sets of traits are used, in what combination, and for what purpose are inextricably tied to why sex categorisation exists and whom or what it serves. Far from neutral or objective, sex classification and definition rely on cultural norms about the “appropriate” relationships between sex, gender, and sexuality, and work in tandem with power to support social norms and goals as well as sociopolitical hierarchies that determine opportunities, rights, and privileges.

Not surprisingly, there is a long history of using—and misusing—discrete biological criteria to determine sex and thereby include or exclude certain people from categories. Just this year, the administration of US President Donald Trump began requiring military personnel to serve “in their biological sex”, which they define as “a person’s biological status as male or female based on chromosomes, gonads, hormones, and genitals” (treating these as congruent). Meanwhile, in a leaked memo, the US Department of Health and Human Services (HHS) proposed establishing a federal legal definition of sex “on a biological basis that is clear,



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grounded in science, objective and administrable". Using early 20th-century criteria, HHS suggested defining individuals as "either male or female, unchangeable, and determined by the genitals that a person is born with", and in yet another definition, "male or female based on immutable biological traits identifiable by or before birth".

For many, these proposed methods for categorisation suggest a commonsense and clear-cut assessment. The US military definition of sex relies on the sex designation on a birth certificate, which is likely based on a glance at the genitals at birth. But its definition of biological sex includes "chromosomes, gonads, hormones, and genitals"—that is, all four characteristics. Someone with what are understood as female-typical genitals and 46,XY chromosomes would be classified as female if genitals are used as the indicator but male if chromosomes are used. The HHS-suggested definition appears to directly prioritise genitals yet gives chromosomes a role too.

Science does not drive these policies; the desire to exclude does. This intentional gerrymandering of sex opportunistically uses the idea of "biological sex"—which lends a veneer of science and thus rationality to any definition—to remove certain individuals from a category based on intolerance. One result is the nullification of the Title IX protections that were expanded under the Obama administration—laws applicable to transgender individuals and people with certain differences of sex development who serve in the military or otherwise seek to be safeguarded from discrimination.

The Trump administration's appeal to "biological sex" has parallels in international elite sport. "The biological sex... must prevail", thundered an official for the International Association of Athletics Federations (IAAF), in the context of a rancorous decades-long battle over sex-testing policies used to determine which women are allowed to compete in the female category. The IAAF's appeal to biological sex is an example of how power, not science, comes to shape sex categorisation. In the 1960s, athletes were sex tested using physical examinations; in the 1970s, chromosomal testing was used. By 2011, sex testing regulations focused exclusively on testosterone (T), and any woman with higher than typical levels of naturally occurring T could not compete in the female category. The rationale for this hinged on T's purported role in athletic performance: high levels of T were said to give some women an unfair "masculine" advantage over their competitors. Their solution: women can lower their T levels or forego sport competition. However, the data didn't support the claim underpinning the regulations: that higher T necessarily improves athletic performance. The IAAF scrambled for a new biological indicator, seizing on a combination of chromosomes and internal reproductive organs, and announced a new, special type of categorisation that was designated "sport sex". This is a category of sex relevant to one unique context: elite sport. Women with

high endogenous T could now compete—if they had a specific combination of chromosomes and reproductive organs. Exclusion is based on a woman's primary source of endogenous T, rather than her T level per se.

The newest T regulations were designed by policy makers as an end-run around strict and deterministic criteria for inclusion in the female category—that is, sex testing. But once T couldn't be shown to have the role in athleticism they claimed, they turned to their own idiosyncratic definition of biological sex to keep women with atypical sex traits out of the female category. While the IAAF's focus on women's chromosomes and gonads was a method of calling out certain women as not "really" women, they attempted to cement this notion by then also inaccurately deeming them "biological males".

Debates about sex are often framed falsely as scientific versus cultural arguments, whereby the former by virtue of being grounded in biology are seen as tied to nature and thus truth, whereas the latter are seen as hectoring from a postmodern gender La La Land. T regulation supporters, for example, have argued that critics of the policy misunderstand, or worse, obscure the scientific facts of sex. Yet this profoundly misconstrues who is hewing to science. Those questioning simplistic understandings of sex—scientists among them—are hardly unscientific, but rather keen observers of the science of sex biology and the peculiar categorical gatekeeping of, say, soldiers and elite women athletes. This is not a case of science versus social constructionism as some argue; it's about the calculated use of "biological sex" to buttress obsolete thinking about sex.

Years ago I wondered, "if one postulates bodies (including genitals, gonads, chromosomes, and hormones), what more does the word sex buy us?...The body as a material fact is given, but sex is not." It is long overdue that we understand sex not as an essential property of individuals but as a set of biological traits and social factors that become important only in specific contexts, such as medicine, and even then complexity persists. If we are concerned with certain cancers, for example, knowing whether someone has a prostate or ovaries is what's important, not their "sex" per se. If reproduction is the interest, what matters is whether one produces sperm or eggs, whether one has a uterus, a vaginal opening, and so on. For those arenas where it's not clear what purpose sex designation serves, we might question whether we need it at all. Doing so could lead to better science and health care, and, crucially, less harm.

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I am co-author, with Rebecca M Jordan-Young, of *Testosterone: an Unauthorized Biography* (Harvard University Press, 2019).

Further reading

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